AMENDMENTS TO THE SPECIFICATION

Please amend the paragraph beginning on line 11 of page 1 as follows:

In recent years, media for recording and transmitting digital-coded and multiplexed video ~~signal~~ signals, audio ~~signal~~ signals, and additional information ~~signal~~ signals such as subtitle information have spread rapidly, like a video CD, a DVD, and digital CS broadcasting. However, in order to spread apparatuses for reproducing the above-described coded and multiplexed digital signals for domestic use or the like, keeping cost down of the reproduction apparatuses is indispensable. For this purpose, it is required to implement a demultiplexer for demultiplexing the multiplexed signal and a decoder for decoding the demultiplexed digital signals, with simple and compact circuit constructions.

Please amend the paragraph beginning on line 3 of page 2 as follows:

Figure 3 shows examples of coded data of video information, audio information, and additional information which are multiplexed by using packets. The coded and multiplexed data are subjected to byte alignment. An audio signal and a video signal are respectively digital-coded by an encoder and then multiplexed in packet units by a multiplexer. At the head of each packet, a packet header H is assigned. The packet header H is composed of a synchronous signal S indicating the head of the packet (hereinafter, referred to as a packet start code prefix), an identifier I for ~~deciding~~ indicating that the packet corresponds to one of packets of audio, video, and additional information, packet length information L indicating the length of the packet, a header length HL, video and audio synchronous reproduction information R and the like. After the packet header H, according to the kind of the packet, one of coded data CDP of the video signal, coded data CDS of the audio signal, and coded data CDA of the additional information is assigned. A part from the packet start code prefix to the header end is defined as a system layer, and a coded data part of video, audio, or additional information data after the header is defined as an elementary layer.

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Please amend the paragraph beginning on line 13 of page 4 as follows:

~~Figure 4 shows~~ Figures 4(a) and 4(b) show two examples of the case where the hierarchy start code of the coded video data is separated between two packets, as patterns of mistaking the packet boundary.

Please amend the paragraph beginning on line 20 of page 6 as follows:

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In this way, since the length of the video packet is not defined, in the conventional coded signal reproduction apparatus, ~~performed is complicated~~ control of not only advancing the reading pointer of the input buffer is complicated but also returning this at the packet boundary.

Please amend the paragraph beginning on line 25 of page 6 as follows:

To be specific, in the conventional coded signal reproduction apparatus, since data transfer and data discrimination are performed simultaneously by using the read pointer of the same input buffer, the write pointer of the decoding buffer must be advanced excessively to a position where the input data can be identified as data of the system layer, when performing writing. Hence, the write pointer of the decoding buffer is advanced by using a decoding buffer write pointer correction unit. Further, when the input data is data of the system layer, the start code must be detected again, and so the pointer value is once returned. To prevent the input data from being ~~broken~~ interrupted by this, an input buffer read pointer correction unit is provided to correct the pointer. Further, to prevent the data input to the input buffer from being ~~broken~~ interrupted, an input buffer protection unit is provided to store the input data, whereby the input data is protected. Therefore, the construction and control of the apparatus are complicated.

Please amend the paragraph beginning on line 17 of page 7 as follows:

~~Secondary~~ Secondly, in reproducing a coded and multiplexed signal, there is a case where header information of packets used for multiplexing must be used. As information required for this, audio and video synchronous reproduction information (PTS) and the like are raised. In many cases, the reproduction information is given in fundamental units of audio and video reproduction. Further,

the reproduction information includes, besides the PTS, information indicating the presence or absence of the PTS for each reproduction fundamental unit data included in each packet. In the coded signal decoding apparatus, when the reproduction information is used for reproduction, it is necessary to store the reproduction information by any means. For example, it is thought that the reproduction information is temporarily stored in a memory inside the coded signal decoding apparatus. However, when the reproduction information includes a lot of audio and video reproduction fundamental units to be input to the decoding buffer in a unit time, since the corresponding synchronous reproduction information increases in proportion to them, hardware required as a memory used for storage increases in size, resulting in increased chip area when it is implemented by an LSI.

Please amend the paragraph beginning on line 15 of page 11 as follows:

Figure 1 is a block diagram illustrating the structure of a coded signal decoding apparatus according to first to third embodiments of the present invention. Figure 2 is a flowchart for explaining the operation of the coded signal decoding apparatus according to the first embodiment. Figure 3 is a diagram for explaining the structure of a multiplexed signal. ~~Figure 4 is a diagram for~~ Figures 4(a) and 4(b) are diagrams explaining a multiplexed signal in which a packet boundary in a decoding buffer is easily mistaken. ~~Figure 5 is a diagram~~ Figures 5(a) and 5(b) are diagrams illustrating the relationship between a video packet and video reproduction units. ~~Figure 6 is a diagram for~~ Figures 6(a) and 6(b) are diagrams explaining a padding process for an end part of coded video data by using a formatter. Figure 7 is a diagram illustrating a unique code sequence inserted in coded and multiplexed data. Figure 8 is a block diagram illustrating a modification of a coded signal decoding apparatus according to first to third embodiments of the invention. Figure 9 is a block diagram illustrating the conceptual structure of a coded signal decoding apparatus according to the present invention. ~~Figure 10 is a flowchart for explaining~~ Figures 10(a)-10(c) explain the operation of the coded signal decoding apparatus of the present invention in the case where an input packet is a video packet, having emphasis on a formatter and a start code state storage unit. ~~Figure 11 is a flowchart for further explaining~~ Figures 11(a)-11(d) further explain the operation of the coded

signal decoding apparatus of the present invention in the case where an input packet is a video packet, having emphasis on a formatter and a start code state storage unit. Figure 12 is a diagram ~~for~~ explaining coded video data reading operation by a conventional coded signal reproduction apparatus.

Please amend the paragraph beginning on line 11 of page 13 as follows:

Figure 1 is a block diagram illustrating the detailed structure of the coded signal reproduction apparatus. This corresponds to a first aspect of the invention ~~of Claim 1 of this application~~, providing simplified structure and control as compared with the conventional apparatus.

Please amend the paragraph beginning on line 21 of page 14 as follows:

Further, 2s7 is a reproduction information hold unit which receives a reproduction signal (SIG4) as an output signal from the header analysis unit 2s6, and holds reproduction information. 2s14 is a start code status hold unit which receives a status updation signal (SIG5) as an output signal from the start code prefix detection unit 2s3, and holds a status which is updated according to the signal. Further, 2s13 is a formatter which receives a reproduction information status signal (SIG17) as an output signal from the header analysis unit 2s6, a formatter activation signal (SIG9) as an output signal from the start code discrimination unit 2s5, a 1-byte signal (SIG6) as an output signal from the start code prefix detection unit 2s3, reproduction information (PTS) (SIG7) as an output signal from the reproduction information hold unit 2s7, and a status signal (SIG8) as an output signal from the start code status hold unit 2s14. When a specific numerical sequence is input to the formatter unit 2s13 according to these signals, the formatter unit 2s13 outputs the corresponding numeric sequence. The formatter unit 2s13 generates data based on information output from the matching status information output means which comprises the start code prefix detection unit 2s3, the start code status hold unit 2s14, and the start code discrimination unit 2s5, and inserts the data sequence in a predetermined position of coded video data.

Please amend the paragraph beginning on line 19 of page 15 as follows:

SW2 is a switch which selects a signal output from one of the start code prefix detection unit 2s3, the formatter unit 2s13, and the terminal c of the switch SW1, and outputs the signal. 2s8 is a data separation control unit which receives a post signal (SIG20) output from the start code discrimination unit 2s5, and a signal output from the input buffer 2s2 when the switches SW1 and SW2 are placed at the terminals c and f, respectively, and recognizes the boundary of packets to perform data separation control. When data transfer has ended, the data separation control unit 2s8 posts it to the start code discrimination unit 2s5 by using the post signal (SIG20). 2s19 is a controller which performs switching control for switches SW1 and SW2 on receipt of a format start/end signal (SIG19) output from the formatter unit 2s13 and a header end signal (SIG18) output from the header analysis unit 2s6, and outputs switching control signals (SIG3, SIG10) for controlling the respective switches.

Please amend the paragraph beginning on line 10 of page 23 as follows:

Hereinafter, a description will be given of the operation of this embodiment in two examples in the case where the hierarchy start code of the coded video data is divided between two packets, as patterns of easily mistaking the packet boundary, with reference to ~~figure 4 and figure 10~~ figures 4(a)-4(b) and 10(a)-10(e).

Please amend the paragraph beginning on line 11 of page 25 as follows:

On receipt of the 1-byte signal SIG6, the start code discrimination unit 2s6 decides that the input 1-byte signal SIG6 is ('00'), or a value from ('00') to ('B8'), or a value from ('B9') to ('ff'). In this embodiment, the input 1-byte signal SIG6 is ('E0'). Since the status is "3" and the 1-byte signal SIG6 is ('EO'), it is decided as an identifier of a video packet from the 1-byte signal SIG6. As shown in figure 11(a), the start code discrimination unit 2s5 posts the status updation signal to the start code status hold unit 2s14 by SIGX1, whereby the status is updated to the status "1" where one ('00') of the hierarchy start code of the coded video data is present. On the other hand, according to the value of the 1-byte signal SIG6 which is input by SIG9, the start code discrimination unit 2s5 sends the

signal SIG9 to the formatter unit 2s13 to control the output data from the formatter unit 2s13. On receipt of the SIG9, the formatter unit 2s13 connects the switch SW2 to e to prepare for transferring the formatter unit 2s13 output through the data separation control unit 2s8 to the decoding buffer 2s9. In this embodiment, the input status of the start code prefix detection unit 2s3 is the status "3" and the 1-byte signal SIG6 is ('EO'), i.e., ('00','00','O1','EO'), and this corresponds to pattern E on Table (1) and, therefore, no formatter unit 2s13 output is present. When the formatter unit 2s13 has completed formatting, it controls the controller 2s19 by using a format start/end signal SIG19 so that the switch SW2 is connected to none of the three terminals. The reason is as follows. Since the packet start code ('00','00','01','EO') is detected according to the SIG9, header analysis takes place after the format output process. A format output completion signal is posted as SIGX2 to the start code discrimination unit 2s5. On receipt of the SIGX2, the start code discrimination unit 2s5 activates the header analysis unit 2s6 with SIG11.

Please amend the paragraph beginning on line 11 of page 27 as follows:

In the case of figure 4(b), as in the case of figure 4(a), one piece of ('00') is output from the formatter unit 2s13 when ('00','00') is input, and the status becomes "2". Even when the next ('00') is input to the start code prefix detection unit 2s3, one piece of ('00') is output from the formatter unit 2s13. To this point, ('00','00') which is a part of the video hierarchy start code at addresses γ, δ is transferred to the decoding buffer 2s9. The operation when the subsequent ('01','EO') is input is identical to the case of figure 4(a). When ('EO') is input as a 1-byte signal SIG6 to the start code discrimination unit 2s5, since ('00','00') is input to the decoding buffer 2s9, the status of the start code status hold unit 2s14 is updated from "3" to "2" by SIGX1.

Please amend the paragraph beginning on line 2 of page 28 as follows:

In the case of pattern B, after the status "1" as shown in figure 10(b), one byte of data ('XX') having a value other than ('00') is input to the start code prefix detection unit 2s3. In this case, as shown in figure 11(c), it is decided that the code sequence ('00','XX') input to the start code prefix detection unit 2s3 is not a start code prefix and, therefore, the start code status hold unit 2s14 is

updated from status "1" to status "0" according to a status updation signal SIGS. The start code status hold unit 2s14 whose status is updated controls the formatter unit 2s13 so that it outputs ('00','XX'), by using a status updation signal SIG8. The activated formatter unit 2s13 sends a format start signal SIG19 to the controller 2s19, and the controller 2s19 connects the switch SW2 to the terminal e, whereby ('00','XX') is output to the data separation control unit 2s8. When the formatter unit 2s13 completes the output, it sends a format end signal as SIG19 to the controller 2s19 to connect the switch SW2 to the terminal d. A formatter end signal SIG16 is sent to the start code prefix detection unit 2s3, and the start code prefix detection unit 2s3 resumes the operation in status "0".

Please amend the paragraph beginning on line 22 of page 28 as follows:

In the case of pattern C, in the status "2" as shown in figure 10(c), ('YY') having a value other than ('00') and ('01') is input to the start code prefix detection unit 2s3. In this case, as shown in figure 11(c), it is decided that the code sequence ('00','00','YY') input to the start code prefix detection unit 2s3 is not a start code prefix and, therefore, the start code status hold unit 2s14 is updated from status "2" to status "0" according to a status updation signal SIG5. The start code status hold unit ~~2a14~~ 2s14 whose status is updated controls the formatter 2s13 so that it outputs ('00','00','YY'), by using a status signal SIG8. The activated formatter unit 2s13 sends a format start signal SIG19 to the controller 2s19, and the controller 2s19 connects the switch SW2 to the terminal e, whereby ('00','00','YY') is output to the data separation control unit 2s8. When the formatter unit 2s13 completes the output, it sends a format end signal as SIG19 to the controller 2s19, whereby the switch SW2 is connected to the terminal d. A formatter end signal SIG16 is sent to the start code prefix detection unit 2s3, and the start code prefix detection unit 2s3 resumes the operation in status "0".

Please amend the paragraph beginning on line 17 of page 29 as follows:

In the case of pattern D-1, in the status "3" as shown in figure 10(e), ('YY') having a value other than ('00') and ('B9')~('ff') is input to the start code prefix detection unit 2s3. In this case, as shown in figure 11(c), it is decided that the code sequence ('00','00','01','zz') input to the start code prefix detection unit 2s3 is not a start code in reproduction unit and, therefore, the start code status

hold unit 2s14 is updated from status "3" to status "0" according to a status updation signal SIG5. The start code status hold unit 2a14 whose status is updated controls the formatter unit 2s13 so that it outputs ('00','00','01','zz'), by using a status signal SIGS. The activated formatter unit 2s13 sends a format start signal SIG19 to the controller 2s19, and the controller 2s19 connects the switch SW2 to the terminal e, whereby ('00','00','01','zz') is output to the data separation control unit 2s8. When the formatter unit 2s13 completes the output, it sends a format end signal as SIG19 to the controller 2s19, whereby the switch SW2 is connected to the terminal d. A formatter end signal SIG16 is sent to the start code prefix detection unit 2s3, and the start code prefix detection unit 2s3 resumes the operation in status "0".

Please amend the paragraph beginning on line 12 of page 30 as follows:

In the case of pattern D-2, in the status "3" as shown in figure 10(e), ('00') is input to the start code prefix detection unit 2s3. In this case, as shown in figure 11(d), 1-byte data is posted by SIG6 to the start code discrimination unit 2s5, and the start code discrimination unit 2s5 decides that there is a possibility that the input code sequence ('00','00','00','01') is a start code in reproduction unit, and the start code status hold unit 2s14 is updated from status "3" to status "4" according to a status updation signal SIG5. In the status "4", when the start code discrimination unit 2s5 receives data ('zz') other than ('00') and ('B9')~('ff') as a further 1-byte signal SIG6 from the start code prefix detection unit 2s3, a status updation signal SIG5 is posted to the start code status hold unit 2s14, whereby the status of the start code status hold unit 2s14 is updated from "4" to "0". On the other hand, the formatter unit 2s13 is activated by the same status updation signal SIGS. The activated formatter unit 2s13 sends a format start signal SIG19 to the controller 2s19, and the controller 2s19 connects the switch SW2 to the terminal e, whereby ('00','00','01','00','zz') is output to the data separation control unit 2s8. When the formatter unit 2s13 completes the output, it sends a format end signal as SIG19 to the controller 2s19, whereby the switch SW2 is connected to the terminal d. A formatter end signal SIG16 is sent to the start code prefix detection unit 2s3, and the start code prefix detection unit 2s3 resumes the operation in status "0".

Please amend the paragraph beginning on line 12 of page 31 as follows:

Further, in the case of pattern D-3, when ('00') and ('XY') other than ('01') are continuously posted by SIG6 in the status "4", the formatter unit 2s13 outputs ('00','00','01','00','00','XY').

Please amend the paragraph beginning on line 15 of page 31 as follows:

Furthermore, in the case of D-4, when ('00','00','01') and ('XY') having a value from ('B9')-('ff') are continuously posted by SIG6 in the status "4", the formatter unit 2s13 outputs ('00','00','01'), and the status of the start code status hold unit 2s14 is updated from "4" to "3" according to SIGX1.

Please amend the paragraph beginning on line 20 of page 31 as follows:

As described above, according to the first embodiment, the formatter unit 2s13 is provided, and when a code sequence which matches with a part ('00') at the head of a predetermined code sequence detected by the start start code prefix detection unit 2s3 is detected, the start start code prefix detection unit 2s3 detects the residual part ('00','00','01','EO') of the detected predetermined code sequence to detect a pattern of ('00','00','00'), and the formatter unit 2s13 outputs one piece of ('00'). After the boundary of packets is defined, amongst data which are not transmitted to the decoding buffer 2s9, data corresponding to code sequences other than the code sequence ('00','00','01','EO') indicating the packet boundary are output to the decoding buffer 2s9. Hence, when separating a coded and multiplexed signal, it is not necessary to perform complicated control such as advance and return of read addresses of the input buffer and, therefore, control of the read addresses of the input buffer by the input buffer reading control circuit is simplified and the hardware scale is reduced, thereby economically providing an apparatus performing reproduction of multiplexed digital code sequences.

Please amend the paragraph beginning on line 15 of page 34 as follows:

When the code that follows the start code prefix is decided as a reproduction fundamental unit start code, the formatter unit 2s13 outputs data obtained by adding the display start information (PTS) as reproduction information stored in the reproduction information hold unit 2s7, to the rear of the reproduction fundamental unit start code ('00','00','01','00'), according to the analysis result of the start

code discrimination unit 2s5. To be specific, as shown in figure 5(b), amongst the plural reproduction fundamental units included in the coded video data, the reproduction fundamental unit positioned at the head timewise is given a status flag and a PTS at the rear thereof, and a code indicating "effective" is given to the status flag. As for the subsequent reproduction fundamental units, since no PTS appears until the next packet header is detected, each of these units is given a status flag to which a flag indicating that the PTS is "ineffective" is given, and the PTS.

Please amend the paragraph beginning on line 6 of page 35 as follows:

In this way, according to the second embodiment, the formatter unit 2s13 is provided, and only the PTS as time display information is captured in the reproduction information hold unit 2s7, amongst the reproduction information included in the packet header. A PTS is given to the rear of the video reproduction fundamental unit start code of each reproduction fundamental unit, and information (flag) indicating "ineffective" or "effective" is given to each of them. Hence, amongst the reproduction information included in the packet header, only the PTS is temporarily held in the reproduction apparatus, while data before decoding are held in the RAM (decoding buffer 2s9) outside the apparatus. Therefore, it is not necessary to hold a lot of reproduction information in the apparatus, and the scale of hardware such as a memory required for holding the reproduction information can be minimized, thereby economically providing an apparatus for reproducing multiplexed digital code sequences.

Please amend the paragraph beginning on line 16 of page 36 as follows:

Figure 6(a) illustrates a pattern of a code sequence at the rear of coded video data, in coded and multiplexed data. As is evident from figure 6(a), the rear of the coded video data has a data pattern which is shorter than the data width of a pipe line output from the multiplexed signal separation unit 2s or the decoding unit 2s10. The start code prefix detection unit 2s3 detects a pattern of ('00','00','01') from the input data pattern, and the start code discrimination unit 2s5 decides a boundary start code ('00','00','01','b7') which indicates video end data. The ('b7') indicates a sequence end code. When the start code discrimination unit 2s5 detects the end part of the video end data as

described above, it posts this to the formatter unit 2s13. Then, the formatter unit 2s13 generates video end data, adds data for padding ('FF') subsequently to the end data code sequence as shown in figure 6(b), and transfers these data to the decoding buffer 2s9. In the case where the byte width is 4 bytes (32 bits), three or more pieces of padding data are added subsequently to the end data code sequence, whereby data equivalent to the bus width including the video end data can be subjected to pipeline processing. To be specific, assuming that the width of a data bus for pipeline transfer is n bytes, when the video data of the end part is positioned at the m-th byte from the bus width boundary, (n-m) or more pieces of padding data are added, whereby the video data of the end part can be read by pipeline processing. By adding the padding data, the video end data part which has been shorter than the data bus width is aligned to the data bus width.

Please amend the paragraph beginning on line 7 of page 40 as follows:

As described above, according to the third embodiment, the formatter unit 2s13 is provided with the data padding function, and padding data are added to the rear of a code sequence which is shorter than the data bus width of pipeline processing, whereby the sizes of data existing in the respective bus width boundaries are made uniform. Therefore, data transfer through the pipeline in the reproduction apparatus can be realized to the end part of coded data which is shorter than the data bus width in the pipeline, without requiring complicated transfer control. Thereby, reliable flow of the end part of the coded data through the pipeline of the reproduction apparatus can be realized without using complicated data transfer control.